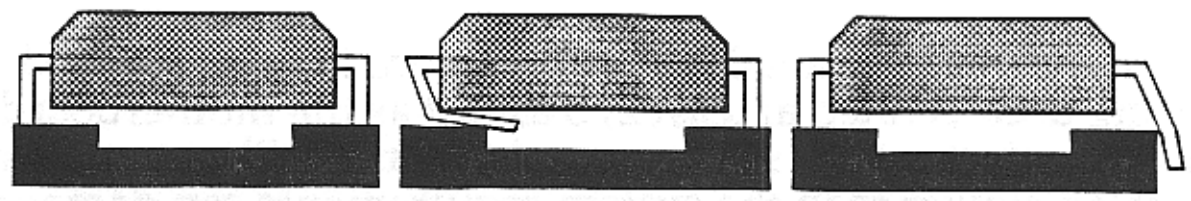
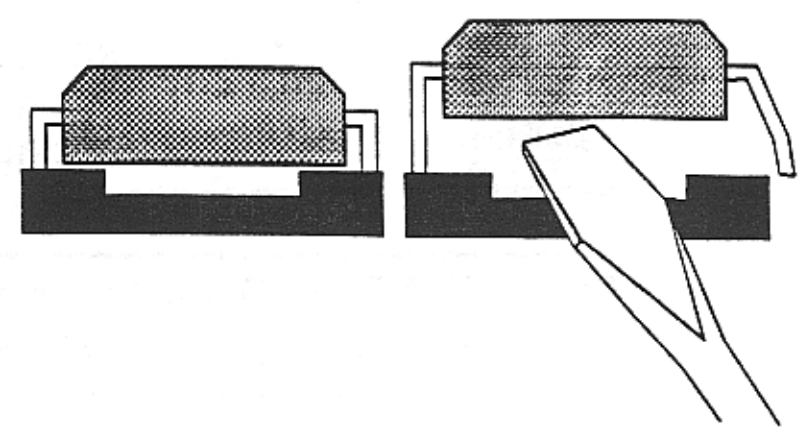
6. After the 80287 has been installed, inspect it closely for pins bent outside the socket, or under the chip itself. Refer to the following diagram.



7. If a bent pin is found or the chip is installed backwards, carefully remove it by prying it from the end with a flat tip screwdriver as shown in the diagram to the right. Re-insert the chip properly.



8. Refer to the system manual or motherboard manual to find out if any motherboard switch or jumper settings need to be changed. Some motherboards have a switch or jumper that is used to enable the use of a math coprocessor. If necessary, make the proper setting.

9. Reinstall all cards, cables and other devices that were removed to access the math coprocessor socket. Replace the computer case cover.

10. Some 80286 based systems require the math coprocessor to be enabled in the "Setup" program. Refer to the system manual for details, or run the setup program and if necessary make the proper settings.

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80287

Intel 80287 Math Coprocessor

The 80287 math coprocessor is available from Jameco in several speeds. Make certain that the math coprocessor being used is rated at least 2/3 as fast as the motherboard operating speed. Installing a coprocessor that is faster than system requirements will not cause any problems, but installing a coprocessor rated slower than the system requirements can damage the coprocessor.

Precautions

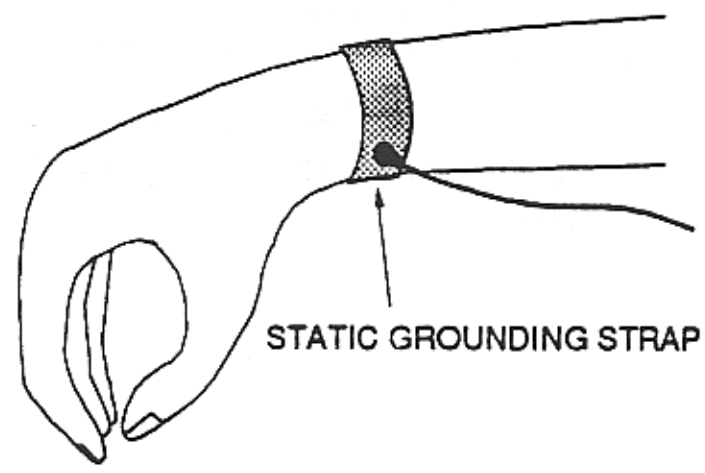
Math coprocessors, circuit boards and most other computer components are extremely static sensitive, and can easily be destroyed by the static electricity that is built up by body movement. In order to prevent damage from occurring to these devices, follow the precautions listed below.

STATIC WARNING - *If the proper precautions are not taken, permanent UNWARRANTED damage could occur to both the motherboard and the math coprocessor.*

1. Make certain that the system is turned OFF and plugged into an outlet so that the power supply is grounded.

2. Dissipate any static charge before touching the math coprocessor or motherboard by either using a grounding wrist strap [Jameco Part #WS] that is connected to the power supply case, or by touching the power supply case often.

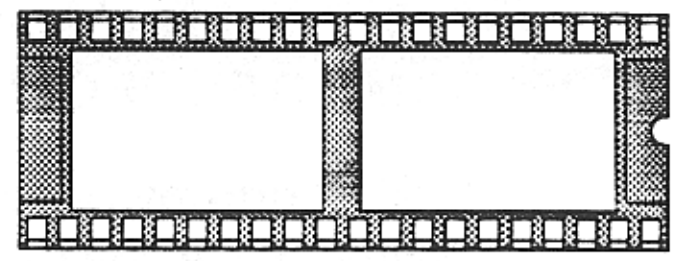
3. Hold the math coprocessor by it edges, not by the pins. Do not set it on the ground, or any other unprotected area.



Installation

1. Remove the cover from the computer case, and orient it so that the motherboard and expansion cards are easily accessible.

2. Locate the math coprocessor socket on the motherboard. It has 20 receptacles on each side and a notch at one end, as shown in the diagram to the right. It is usually located at the bottom of the motherboard, near the 80286 microprocessor. Most system manuals and motherboard manuals show the location of the 80287 socket.

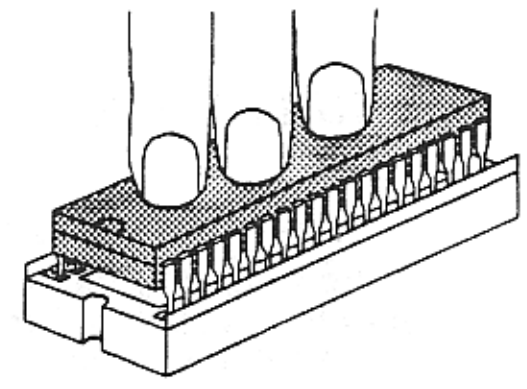


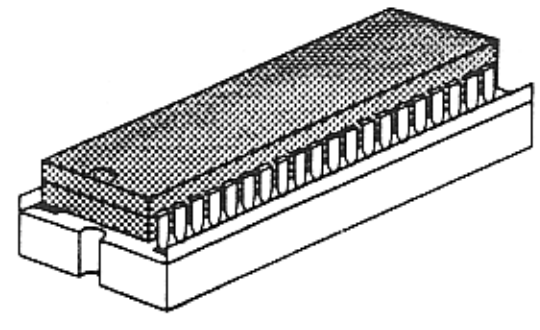
3. Remove any expansion card(s) and/or cable(s) that block access to the 80287 socket. Make note of which devices are removed, so that they can be replaced easily.

4. Before attempting to insert the chip into the socket, ensure the notch on the chip is facing the same direction as the notch on the socket.

WARNING *Installing the chip with the notch in the wrong direction will cause permanent UNWARRANTED damage.*

5. Orient the math coprocessor so that its notch lines up with the notch on the socket. Start the pins from one side of the chip into the socket, making certain that each pin is started into its receptacle, then line up the other side. When absolutely certain that all pins are started correctly, firmly press the chip all the way into the socket so that each pin is fully seated. Refer to the diagrams to the right for proper installation technique.





JAMECO®
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Intel 80287 Math Co-processor

Jameco Part #s: 51836, 51828, 40483

1355 Shoreway Rd. Belmont CA 94002 • Tel: 1-800-831-8020 • Fax: 1-800-237-6948 • BBS: 415-637-6948

The 80287 math co-processor is available from Jameco at several speeds. Make certain that the math co-processor being used is rated at least 2/3 as fast as the motherboard operating speed. Installing a co-processor that is faster than the system requirements will not cause any problems, but installing a co-processor rated slower than the system requirements may damage the co-processor.

Precautions

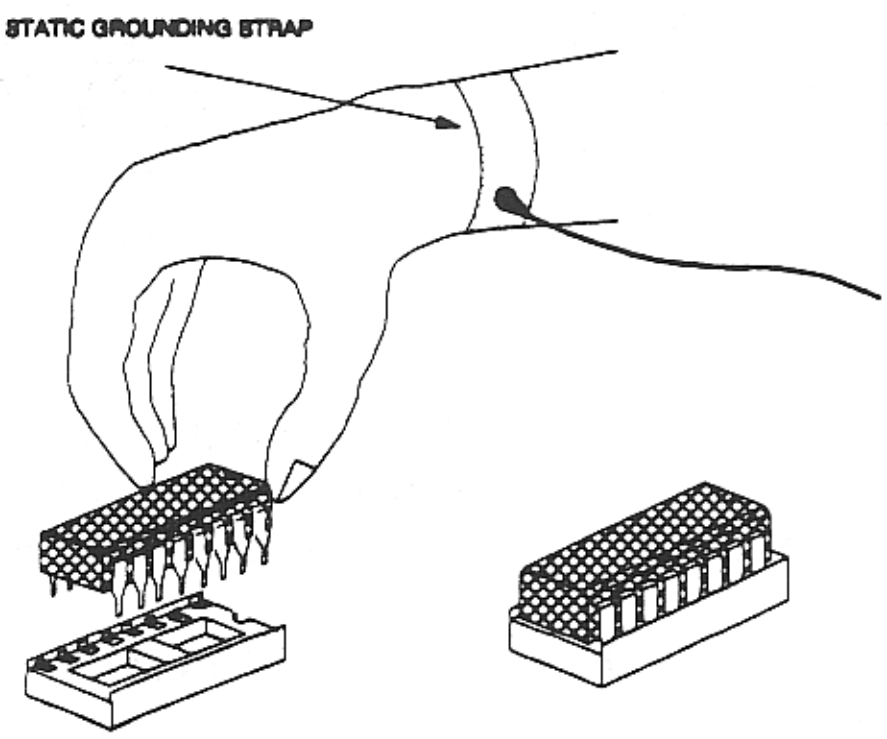
Math co-processors, circuit boards and most other computer components are extremely static sensitive, and can easily be destroyed by the static electricity that is built up by body movement. To avoid damaging these items, follow the precautions below.

STATIC WARNING - If the proper precautions are not taken, permanent **unwarranted** damage could occur to both the motherboard and the math co-processor.

1. Make certain that the system is turned OFF and plugged into an outlet so that the power supply is grounded.

2. Dissipate any static charge before touching the math co-processor or motherboard by either using a grounding wrist strap [Jameco Part #34551] that is connected to the power supply case, or by touching the power supply case often.

3. Hold the math co-processor by it edges, not by the pins. Do not set it on the ground, or any other unprotected area.



Installation

Remove the cover from the computer case, and orient it so that the motherboard and expansion cards are easily accessible.

Locate the math co-processor socket on the motherboard.

NOTE: Drawings are not exact. The 287 processor has 40 pins, not 14, as the drawings indicate.

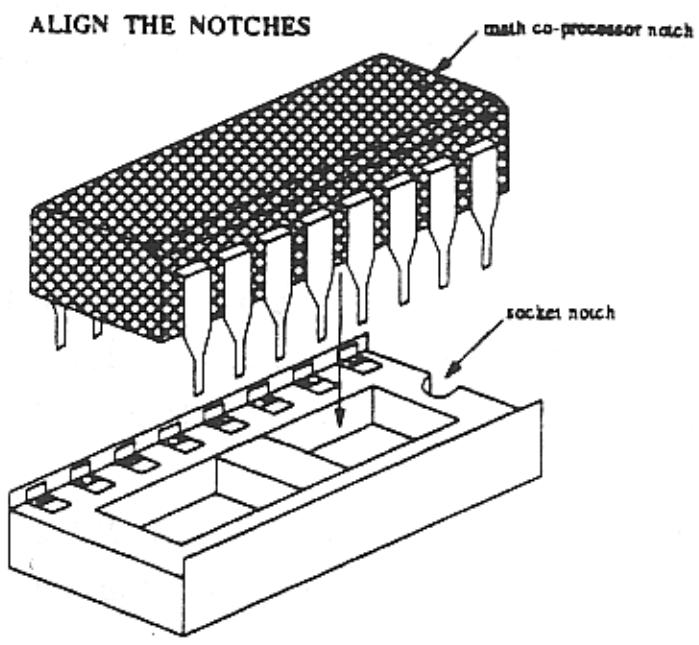
The socket has receptacles on each side and a notch at one end. It is usually located at the bottom of the motherboard, near the microprocessor. Most system manuals and motherboard manuals show the location of the math co-processor socket.

Remove any expansion card(s) and/or cable(s) that block access to the math co-processor socket. Note which devices are removed, so that they can be replaced easily.

Before attempting to insert the chip into the socket, ensure the notch on the chip is facing the same direction as the notch on the socket.

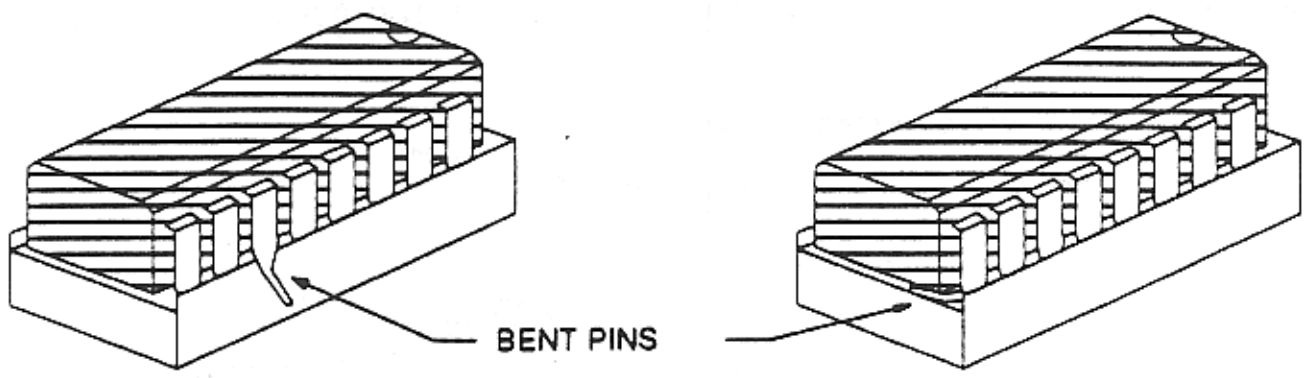
WARNING: Installing the chip with the notch in the wrong direction will cause permanent UNWARRANTED damage.

Orient the math co-processor so that its notch lines up with the notch on the socket. Start the pins from one side of the chip into the socket, making certain that each pin is started into its receptacle, then line up the other side.



When absolutely certain that all pins are started correctly, firmly press the chip all the way into the socket so that each pin is fully seated.

After the math co-processor has been installed, inspect it closely for pins bent outside the socket, or under the chip itself. If a bent pin is found or if the chip is installed backwards, carefully remove it. Re-insert the chip properly.



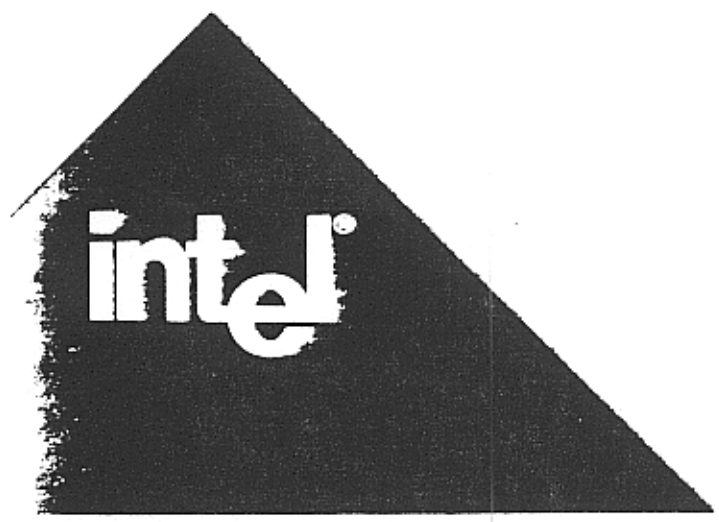
Some motherboards have a switch or jumper that is used to enable the use of a math co-processor. Refer to the system manual or motherboard manual to find out if any motherboard switch or jumper settings need to be changed. If necessary, make the proper setting.

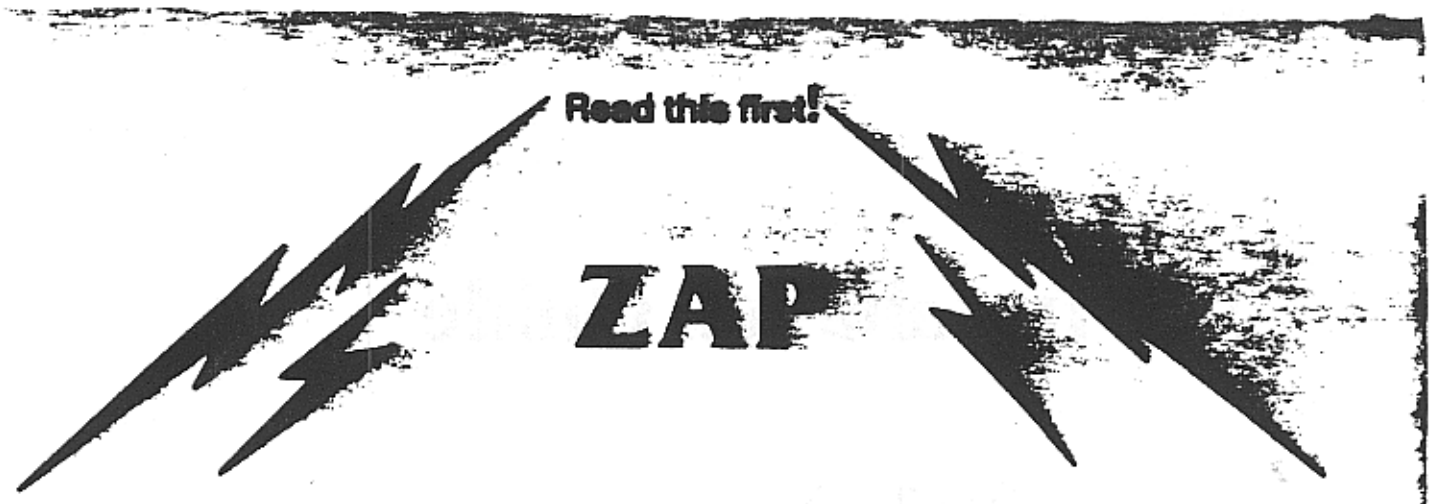
Reinstall all cards, cables and other devices that were removed to access the math co-processor socket. Replace the computer case cover.

Some systems require the math co-processor be enabled in the "Setup" program. Refer to the system manual for details. Run the setup program and make the proper settings, if necessary.

Installation Guide

80287





Follow these instructions to avoid damaging your component:

1. *Read the manual. This component can be damaged by static electricity, and by installing it incorrectly.* Leave the component in its static-resistant tube until you're ready to insert it in the socket on your computer.

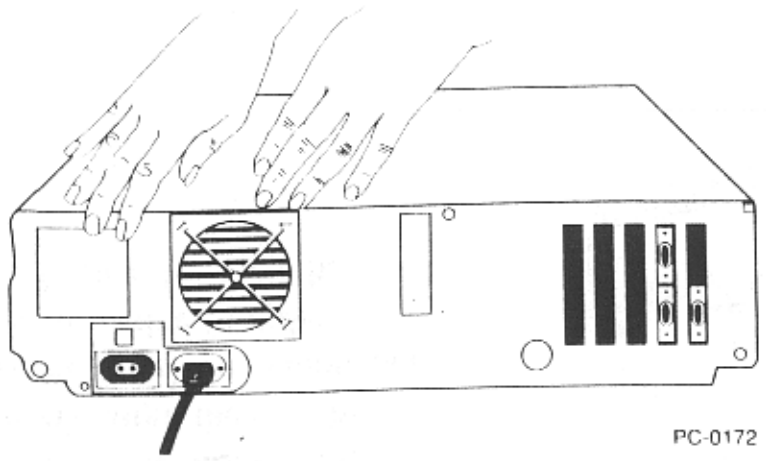
2. Before you take the component out of the tube, touch the metal back or side panel of your computer's system unit to remove static electricity from your hands.

Warning: Danger to Equipment! *Do not put this 80287 into any computer with an 8088, 8086, or 80186 processor; if you do, it could damage the 80287 or the computer.*

Warning: Danger to You! *Be sure to turn off the computer's power switch and unplug the power cord from the wall outlet. If you don't, you could electrocute yourself.*

If installation sounds risky, let your dealer install the 80287. If you make a mistake, you could damage the 80287, your computer, or yourself. If you decide to do it yourself, follow these instructions exactly. If you damage the 80287 while installing it, your warranty is void!

1 Ground yourself and remove cover

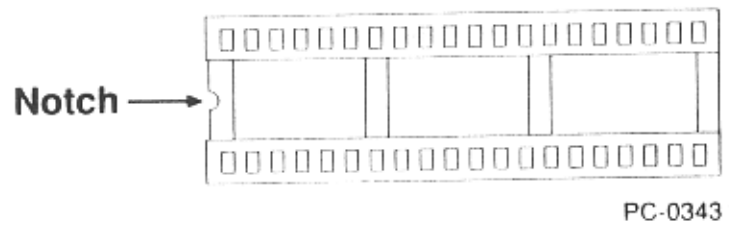


PC-0172

Your computer can be damaged by static discharge. You're less likely to discharge static electricity if you ground yourself by touching the metal on your computer, as shown above, before you begin installation.

Remove the cover from the computer.

2 Find the 80287 socket



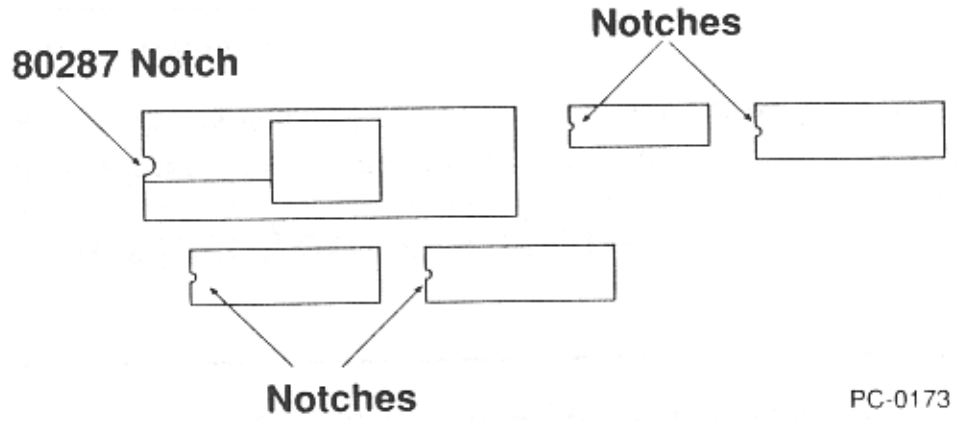
PC-0343

Find the 80287 socket on your computer's system board. The socket has 20 holes on each side, and is generally at the bottom of the system unit near the 80286 processor. Some computers' installation manuals show the socket location.

Remove any board blocking access to the 80287 socket.

3 Make sure the notch faces the right way

Align the chip so that its notch matches up with the notch on the socket. Usually, all the chips on your computer's system board have notches that face the same way. If you're unsure, see your computer's manual or ask your dealer.

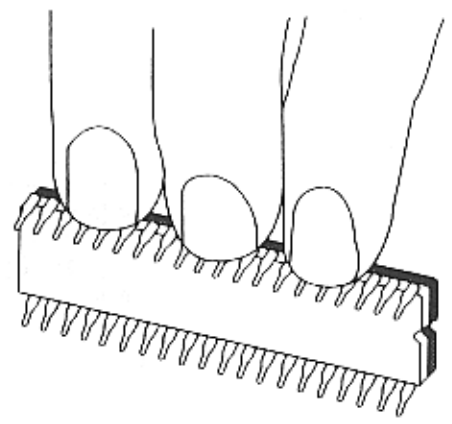


PC-0173

If the notch on your socket doesn't face the same direction as the other chips on the board, ask your dealer for help. If the 80287 chip is inserted the wrong way, your chip won't work and could be damaged.

4 Make sure the pins are straight

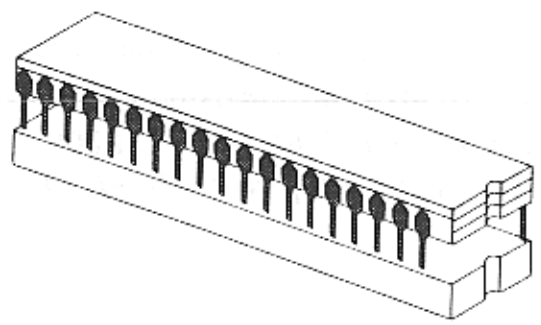
Before you install the 80287, verify that its pins match up with the holes in the socket. If they don't, align the pins by laying the 80287 on its side on a table and gently pressing its top edge (not the pins) as shown below. Repeat for the other row of pins.



PC-0174

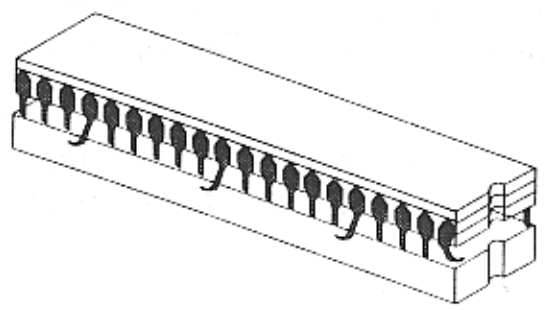
5 Insert the 80287 chip

When you are sure the pins are aligned correctly, press firmly and evenly on the 80287 to "seat" the pins in the socket.



PC-0176

Carefully examine the 80287's pins. Look for any pins that are bent under or out. If you find bent pins, remove the 80287, gently straighten them, and insert the chip again.



PC-0177

6 Set switches on the system board

Check your computer's manual. You may need to set a switch on the computer's system board to let the computer know you've added the 80287.

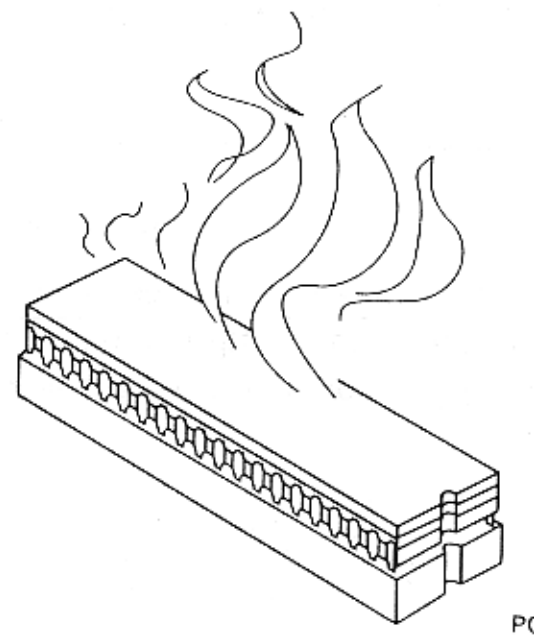
7 Restart your computer

Reinstall any boards you removed, then put the cover back on the system unit. Reconnect all the cables and cords, and plug the power cord into the wall outlet.

Turn on your computer.

If your computer requires it, run the computer's setup or configuration program.. Some computers can't use a math coprocessor until you run their programs (see your computer's manual).

OK =



PC-0643

It's normal for the 80287 chip to run "hot" to the touch, especially after performing many floating-point operations.

The Intel® 80287 Math CoProcessor

The Intel 80287 helps your 286-based computer do more work in less time.

Will you notice your computer running faster? Yes, if you're using a program that does floating-point math, and if that program is written to take advantage of a math coprocessor.

The math coprocessor takes over floating-point math from the microprocessor. For example, dividing a decimal can take 100 calculations without a math coprocessor, and 1 calculation with a math coprocessor. Here are some ways that programs use floating-point math:

Spreadsheets:	Periodic interest, trigonometry, net present value
Databases:	Calculations in the database (interest, etc.)
Graphics:	Draw-type programs when drawing objects
Desktop Publishing:	Fonts, display redraws, Postscript emulation
CAD:	Drawings generated by formulas; redraws

Generally, programs that use lots of floating-point arithmetic will speed up more than programs that do not.

To order technical literature

If you bought the Intel 80287 Math CoProcessor because you want to design hardware that contains it or software that uses it, you'll benefit from the technical literature that Intel can provide.

Call the Intel Literature Department at the following number to order the 80287 literature package: **(800) 548-4725**

Customer Support

Here are four easy ways to reach Customer Support.

1 **Send a Fax.**
From inside the U.S. but outside Oregon: **1-800-458-6231**
From Oregon and outside the U.S.: **(503) 629-7580**

2 **Call FaxBack.**
If you have a touch-tone phone and a fax machine or Intel Connection CoProcessor, you can get a copy of anything in our tech support library — the same product and technical info we use ourselves! To see how easy FaxBack is to use, call FaxBack at **(503) 629-7576**. Available 24 hours a day, every day.

3 **Use Your Modem.**
You can use your modem to read these bulletin boards:

Intel	**(503) 645-6275**
CompuServe:	**mailbox 70307,461; forum GO INTEL**
MCI-Mail:	**INTEL SUPPORT**

For the Intel Bulletin Board, set your modem for 300, 1200, or 2400 bits per second; no parity; eight data bits; and one stop bit. If you would like a copy of CHKCOP, Intel's Math CoProcessor test program, you can use your modem to download it.

4 **Talk to a Customer Support person.**
If you live in the United States or Canada, call **1-800-538-3373** Monday through Friday, 7 AM through 5 PM Pacific time. If you live outside the U.S. or Canada, call **(503) 629-7354**. You can also leave a voice message any time, day or night.

Troubleshooting

Symptoms	Possible Solutions
The computer doesn't power on when you turn on the switch, or the operating system prompt doesn't appear on the screen.	*Check the following:* The power cord is plugged into the wall outlet. All cables and cords are attached correctly. Any boards you removed and reinstalled are properly seated and reconnected. The 80287 is properly installed in its socket. Is the 80287 pushed all the way into its socket? Does the 80287 have bent pins? (You'll have to remove the 80287 to check for bent pins.)
Your application programs don't run any faster with the 80287 installed.	*Check the following:* If your application has a status screen, check it to see that the program recognizes the 80287. If the program doesn't recognize the 80287, check that it is properly installed in its socket. Is the 80287 pushed all the way into its socket? Does the notch on the 80287 chip face the same direction as the notches on other chips in the computer? Does the 80287 have bent pins? (You'll have to remove the 80287 to check for bent pins.) Does your application use much floating-point arithmetic? Some applications (such as word processing), don't use floating-point arithmetic. The 80287 can't speed up programs that don't use floating-point arithmetic. Intel has a math coprocessor test program, CHKCOP, that you can copy from Intel's electronic bulletin board service. Set your modem for 300, 1200, or 2400 bits per second; no parity; eight data bits; and one stop bit. You can also request the program from Customer Support.
The 80287 feels very hot, especially after doing heavy calculations.	It is normal for the 80287 to generate heat, especially after performing many calculations.

Installing the Intel® 80287 Math CoProcessor

This guide explains how to insert the 80287 in your 80286-based computer.

Which 80287?

The 80287 coprocessor is available in three speeds: 6 MHz, 8 MHz, and 10 MHz. The speed is shown on top of the 80287, after the dash (80287-6, 80287-8, or 80287-10). The speed you need depends on how fast your computer accesses the 80287, not on the speed of your CPU. Use the following list to determine which 80287 to use with your computer.

If your computer isn't on the list, check the computer's *Operations Guide* or comparable manual, call your dealer, or contact the computer's manufacturer.

80287-6

AT&T 6300 Plus
Compaq Deskpro 286 (8 MHz)
Compaq Portable 286
Epson Equity III
HP Vectra (older models)
IBM PC/AT (6 & 8 MHz)
IBM 3270 AT
IBM XT 286
ITT XTRA XP
Kaypro 286i
Mach 20 -6 or -8
NRC PC8
PC Designs Turbo AT
Tandy 1000TX
Tandy 3000
TI Business Pro
Zenith Z200

80287-8

AST Premium 286
Compaq Portable II, III
Compaq Deskpro 286 (12 MHz)
Compaq Deskpro 286e
Dell System 200
Epson Equity III +
HP Vectra ES, ES/12
NEC APC IV
PC's Limited AT
Sperry IT
Tandy 4000
Televideo AT
Wang PC 280
Zenith Z248-12

80287-10

ALR Dart 12 MHz
ARC Pro Turbo
IBM PS/2
Models 30/286, 50, 50Z, and 60
Northgate 286-12
All 10-MHz 286 Turbo Cards

5-Year Limited Warranty

Intel's limited warranty covers components only as Intel delivers them. If you damage the component while installing it in your computer, this warranty does not cover repair or replacement. Intel recommends that you have your Authorized Intel dealer install this component and any accessories.

Intel Corporation warrants this component to be in working order for five years from the date you purchased it from your authorized Intel dealer. If the component fails to be in working order during these five years, Intel will, at its option, repair or replace the component at no charge except as set forth below.

Intel furnishes warranty service on an exchange basis. Intel may repair or replace your component with new or reconditioned parts, and any replaced components or parts become Intel's property.

This limited warranty does not cover repair of components damaged by abuse, accident, disaster, misuse, or incorrect installation.

To obtain warranty service, deliver the component, along with proof of purchase date, to the dealer from whom you bought it. If you choose to ship the component to your dealer rather than delivering it in person, you must assume the risk of damage or loss in transit. You also must use the original shipping container (or the equivalent) and pay the shipping charges.

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